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Towards a Practical Guide for Developing Knowledge Management Systems in Small Organizations

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Abstract

There is no common method for developing KMS in organizations; practice is dominated by proprietary and ad hoc approaches and is often oriented towards information systems development. Currently KMS development (KMSD) omits the creation of KM cultures in unique organizational contexts, how to 'operationalize' knowledge, and how to support KMS with appropriate technologies. The paper provides practical insights via explanatory elements of a guide for a principled and useful KMSD approach, one which is adaptable for the complex situations of constantly and unpredictably changing environments and specific settings and needs of organizations. The guide's concepts and approach have emerged from and been validated in practice by an inquiry into a number of problems experienced by particular organizations. For practitioners the paper presents insights into how to develop KMS that address organizational needs. For scholars our guide to a KMSD approach addresses calls in the literature for empirical research into the deployment of KMS and the role of IT in supporting KMS.

Keywords

knowledge management systems, KMS development, KMSD methodology, KMS architecture, systems development, business improvement, small and medium enterprises, SME.

1 Introduction

There is a lack in practical insights into developing Knowledge Management Systems (KMS) for organizations. Despite the various conceptual models and frameworks for KMS in the literature, empirical research that informs the practice of KMS in organizations is still scarce. This paper presents practical insights into developing KMS in small organizations through elements of a practical guide for Knowledge Management Systems Development (KMSD) in organizations. These insights emerged from actual development of KMS in two small organizations, as part of an ongoing action research inquiry (McKay & Marshall, 2001) that investigates practical development of KMS in organizations and the role of IT in supporting KMS.

It is important to first define what we mean by KMS. KMS are often defined as tools and technologies that support KM activities in organizations (Davenport et al., 1998; Nevo & Chan, 2008) or as a (special) class of information systems (Hahn & Subramani 2000).

Equating KM 'systems' with IT 'systems' happens to such an extent that to describe requirements for KMS is typically taken to involve the specification of how IT should be used. This has a distorting effect on both research and practice. If we know what is needed of KM, then a 'system' that supports it is no more than the set of interacting elements or entities that as a whole support KM. The question of whether one or more element is a database-oriented information systems, a web site, a blog or a chat room is subsidiary to the question of what can KM offer and organisation, and what technologies might help as system to support KM for its organisational purposes.

KM theory itself lacks philosophical coherence; there is insufficient cross-pollination or influence of ideas from the disciplines whose theories serve to explain behaviours in organisations (Moteleb & Woodman, 2007). These result in “missing the opportunity to build synergistically on the work of colleagues in related disciplines” (Subramani *et al.*, 2003). Furthermore, approaches for KMSD are often derived from and dependent on development methodologies for information systems (IS). Arguably, these are not adequate for KMSD because of the unique context of KM in organizations (Hahn & Subramani, 2000). As a result, implementation of successful KMS in practice is hampered by divergence and fragmentation in KM theory and models (Gray & Meister, 2003; Subramani *et al.*, 2003), lack of insight into how organizations can develop KMS in a broader sense (Rubenstein-Montano, 2000) and lack of understanding into what role can IT play in supporting KMS (Malhotra, 2005).

Thus, in the context of our research, and hence this paper, the term *system* is used here to refer to organizational *settings* that enable interactions related to knowledge-work among people, processes and IT. In that respect, the term includes social and business activities (individual behaviours and processes), in addition to technology infrastructure and IT used to enable certain interactions in organizations.

The paper proceeds with a brief overview of the current state of KMSD in practice, explaining why organizations need a guide for developing their KMS, and illustrates our KMS guide, describing how it emerged from practice. Section 2 explains in some detail the emergent concepts, principles, assumptions and activities of the guide, grouped in five intertwined aspects. Following that the paper presents an evaluation of the guide in practice. Then the paper concludes with the value of the guide to organizations and practitioners.

2 KMS Development Is Not Working In Practice

Organizations and KM practitioners lack insight into how to develop KMS in a justifiable, repeatable manner. Approaches to developing KMS in organizations remain proprietary and ad hoc with no philosophical coherence. Management consultancies, for example, use their own approaches to KMSD (Hahn & Subramani 2000; Rubenstein-Montano 2000), while other practitioners use their individualistic, ad hoc modelling methods and approaches.

Addressing such issues is hindered by a paucity of empirical research that tackles the relationships among organizational, social and technological aspects of KMS. We argue that lack of empirical research that informs the practice of developing KMS is also hindering the ability of KM practitioners to develop effective KMS and the ability of organizations to grasp real value from KM.

The KMSD approach described in this paper is the refined outputs of an action research (McKay & Marshall, 2001) carried out over several years (see Moteleb & Woodman, 2008) that addressed the following questions: (1) how should practitioners determine what is a KMS for a particular organisation? (2) how should they be developed in a manner that is justifiable and repeatable? and (3) what is the role of IT in supporting KMS? The ultimate aim of our work is to uncover from practice a methodology (philosophical principles plus practical procedures and techniques) for KMSD.

The research that resulted in the practices described in this guide was carried out with SMEs. In the context of KM, SMEs are not so different to larger organizations: they suffer from poor knowledge communication, they fear losing knowledge, staff who do not share knowledge are a problem, and understanding how to innovate is a permanent challenge. However, SMEs have attributes that help researchers in KM and KMSD: the susceptibility of small organizations to KM-related difficulties resulting from changes in their environment is matched by responsiveness to change and greater agility than is obvious in larger organization.

A guide to a practical, holistic and coherent KMSD is envisaged to provide practitioners with a justifiable and repeatable way to develop KMS in organizations. The practices described by the guide will also enable organizations to have better control, management and integration of their KMS.

3 Overview of KMS Approach

The guide for developing KMS in organizations described in this paper is grounded in practice. It is based on a KMSD approach that has emerged and has been validated both in practice and in relation to KM (Moteleb & Woodman 2008) and related to the literature (Moteleb *et al.*, 2005) using Grounded Theory (see Glaser & Strauss 1967).

Our KMSD methodology aims to assist organizations and practitioners in developing KMS. Because KMSD must be contextual (uniquely situated within a particular organization), at the detailed level the guide is not prescriptive regarding the procedures and techniques used for any phase. For example, it does not prescribe the use of certain types of workshop as best for carrying out participatory design. The KMSD methodology is composed of principles and actions, grouped into five interacting 'phases' as illustrated in Figure 1.

- I. Sense-making – about the organization and its business problems
- II. Envisioning – working out what ideal knowledge work would lead to improvement
- III. Designing – choosing what knowledge agents, knowledge flows and knowledge interactions would make up a KMS for the envisioned improved knowledge work
- IV. Exploring – examining what if any IT is needed to support the emerging KMS
- V. Evolving – managing change in the KMS until some future point when the organization's needs would require that sense-making be undertaken to begin the cycle again.

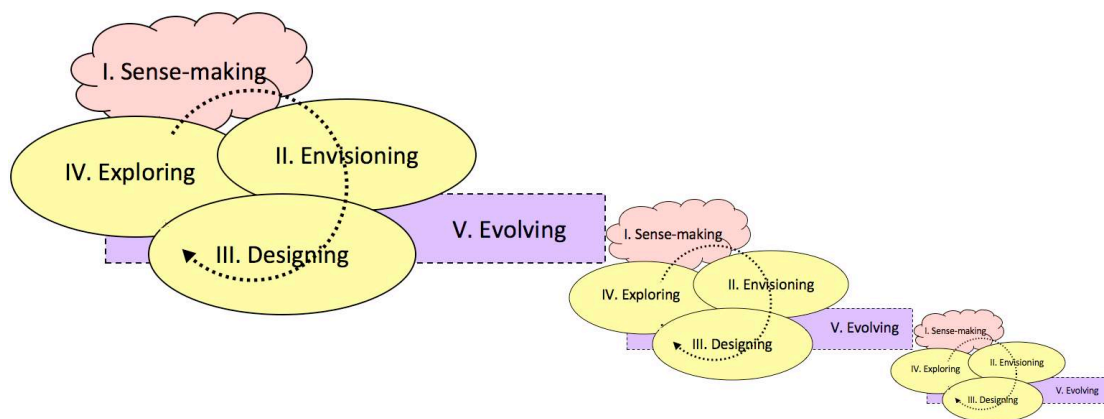


Figure 1: Guide for developing KMS in organizations

The first phase – sensemaking is the starting point in the cycle to be able to shape the needs of the organisation and to determine if those ideas labelled 'knowledge management' can help. It is about making sense of an organization's current problematic situation; its aims are to produce some understanding of why the organization needs a change, to articulate the business problems, and to decide whether knowledge management and a KMS is a potential solution. The second, third and fourth phases are the most intertwined (Moteleb & Woodman 2008) and only take place after sense-making has reached a point where a future, improved situations can be articulated. Those middle phases are concerned with starting the development of a KMS and include collective envisioning of a desired improved situation, designing the KMS and exploring technologies to support the KMS. These phases are tightly interconnected and thus carried out in an iterative, possibly agile style. The resulting KMS is in a state of continuous improvement and its behaviour can never precisely be predicted by the organization, and thus is never completed or terminated. The organization needs therefore to keep monitoring changes in trends and patterns of behaviour early enough to be able to manage the evolutionary potential of the KMS. This makes the fifth aspect.

Note that Figure 1 depicts the possibility that repeated cycles of the five phases may be identified as some 'old order' of an organisation is reviewed and some 'new order' is embarked upon. Cycles of sensemaking, envisioning, designing, exploring technology and managing evolution continue then as long as the KMS exists.

The KMSD approach is fully participative as it is carried out by a team consisting of the problem stakeholders (who affect and/or being affected by the problem situation) of an organization, aided by external, impartial KM consultants. The resulting KMS belongs to the organization which designed and which originated it. The role of KM consultants is to assist and guide processes carried out by, and fully owned by, the organization developing a KMS. The team aspect is important, because multiple perspectives are a crucial facet of KMS and are needed to achieve validation through the techniques of grounded theory (see Glaser & Strauss 1967). (And, the impartiality and process knowledge of external practitioners is more important than domain knowledge or expertise.)

4 Guide for Developing KMS in Organizations

In this section we explain the practice of KMSD we have proposed. The emphasis here is practical and minimal reference is made to the research that underpins the practice. It is described in terms of KM 'consultants' whose main role, as we shall describe, is to guide those members of an organisation who own the problems being tackled and their solutions. Our work (Moteleb & Woodman 2008) has shown that a KMS can work if fully owned by those in organisations who help articulate the problems and who envisage the changed situations. It is important to recognise that we are not about quick fixes but creating a *system* that is sustainable and that consultant works with a team who will continue to develop the *system*. This means ownership of a KMS is not just for its development project but, in essence, forever. Hence we assume that a team always exists to develop and maintain a KMS; the consultant works with the team mostly as a guide and a facilitator – definitely not as champion of known solutions.

Phase I: Engage in Sense-making Conversations

The first phase is about making sense of the current, problematic situation in the organization. Because all parties need to share aims and objectives for the work, not mention evaluation criteria, this aspect usually precedes the launch of a formal KMSD project and gives its rationale and targets. It gives rise to the need for a KMSD project through a plausible problem definition.

Sensemaking Activities

Using conversations, the KM consultant helps the organization make sense of its problematic situation and clearly articulate its business problems. It is rare that the consultant will start a change project with the business problems clearly set out (see Weick 1995).

Often organizations express a need for change more in terms of solutions they want and are excited about, and less in terms of the actual business problems that they are facing. These business problems are often embedded in relationships and activities, and therefore “must be constructed from the materials of problematic situations, which are puzzling, troubling, and uncertain” (Weick 1995). In making sense of the starting situation, the consultant aims to clearly articulating actual business problems without using ideas that might form solutions. That means stating problems without mentioning KM or its absence.

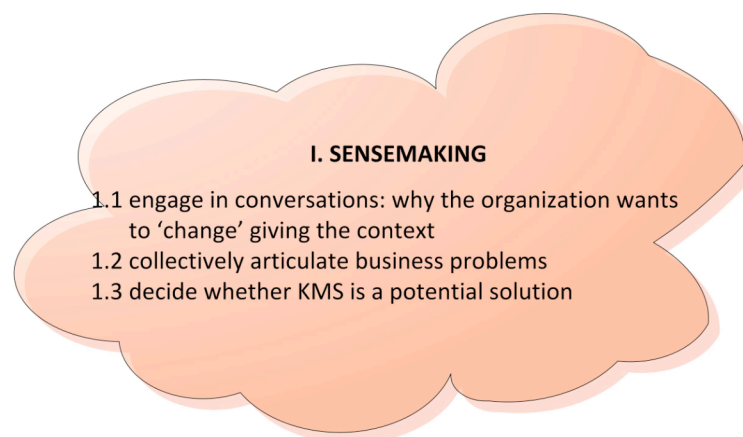


Figure 2: Sensemaking activities

Accordingly, in this first phase the consultant engages the organization in initial conversations that will lead to a collective understanding and articulation of business problems and deciding whether a KMS is appropriate – creating situational awareness and understanding in situations of high complexity or uncertainty in order to make decisions (Klein et al. 2006a & b).

Figure 2 depicts the three activities involved in sense-making. These activities are numbered according to a simple ordering scheme, but in practice one activity can happen before another and rarely completes before the 'next' has to be started.

The team (with its consultants) needs to explore the organization's problems it is concerned with (i.e. the problems whose solutions will be in a future KMS). As part of identifying the problems, the team needs to associate them with three themes: (1) locating knowledge; (2) communicating knowledge; and (3) interacting with knowledge. If many or most of the problems can be associated with these themes, KM and KMS have a role. If not, then the organization may want to fix the other problems first.

A team composed of problem stakeholders and KM consultants engage in initial – often unstructured – conversations to explore business issues that led the organisation to think that it may need 'change', and what implications this 'change', or lack of it, may have on the organisation.

This and subsequent and parallel conversations will indicate if there is a KM aspect in what it needs to achieve, and whether our KMSD approach could be useful. These initial conversations are important because it leads the team and its consultants to think that the organization needs a KMS or they don't. In the former type that are amenable to KM solutions what transpires, typically, are concerns that the organization has about KM-related issues, e.g. loss of skills/knowledge, failures in outsourcing, collaboration between staff and contractors, time to competence of new staff, expected independence with impediments for action. The consultant can usually see that these business problems are generally related to KM problems with the organisation's ability in: (1) locating knowledge; (2) communicating knowledge; and (3) interacting with knowledge.

Requirement for 'open mind set'

Organizations who appear to be lost or fickle regarding solutions, or are simply relaxed and adaptable about solutions, tend to be amenable to a KM/KMS approach. Their uncertainty often allows shared ownership to develop.

Organizations who appear to *know* what they need are usually not open to KM-based solutions. This may either be in terms of the way solutions are framed (as in KM), actions required (Dawson & Balafas 2008), or IT-based solutions. The more certain the organisation as to how its problems can be solved, even if the solution is ostensibly about KM, the least likely is a KMS to be properly developed and so successful.

The more problem stakeholders are involved in initial sense-making conversations the better is the understanding of the problematic situation and its context. "The social context is crucial for sensemaking because it binds people to actions that they then must justify, it affects the saliency of information, and it provides norms and expectations that constrain explanation" (Pfeffer 1978, cited in Weick 1995). The social context in the case of organizational KMS transcends the internal organizational environment because internal business processes and work behaviour are ever more linked and affected by the organization external environment.

This first phase, therefore, should take as long as it requires for business problems to be plausibly formulated. This may sometimes require weeks or months! Notice that what matters in Sensemaking is to *plausibly* formulate business problems and not necessarily accurately define them, because iterated activities in the core three aspects of the KMSD approach (see below), will help enhance understanding of the business problems. "Sensemaking involves turning circumstances into a situation that is comprehended explicitly in words and that serves as a springboard into action" (Weick et al. 2005). This phase, however, can – and is expected to – be revisited during the project as the act of formulating the problem in itself causes a change in the problematic situation, and hence the need sometimes to re-formulate the problem. The outcome of the Sensemaking phase is an explicit formulation of business problems

Sensemaking continues with the following phase through collectively envisioning a desired improved situation. “Explicit efforts at sensemaking tend to occur when the current state of the world is perceived to be different from the expected state of the world, or when there is no obvious way to engage the world” (Weick *et al.* 2005).

Phase II: Envisioning improved situations

The second phase – highlighted in Figure 3 as part of the middle intertwined phases – is concerned with collective envisioning of a desired improved situation that clearly addresses the business problems (challenges and/or opportunities) that have resulted from initial conversations in sensemaking. The focus here is still on business but from the positive perspective of constructing something new than the negative one of diagnosing problems. Here the team engages in conversations, e.g. in workshops, to envision improved situations and what it means in terms of changing business processes and work behaviour. The outcome is an explicit, continuously emerging vision of the improved situations to which an organization aspires: it is continuously emerging because it changes over and over, as other phases come into play and ideas about the future are refined.

The vision is derived from the original business problems of the organization and so is unique to it. Therefore the vision has to be owned and maintained by the organization, not by consultants whose roles include assisting exploration (e.g. via probing and mapping) and suggesting avenues for progress.

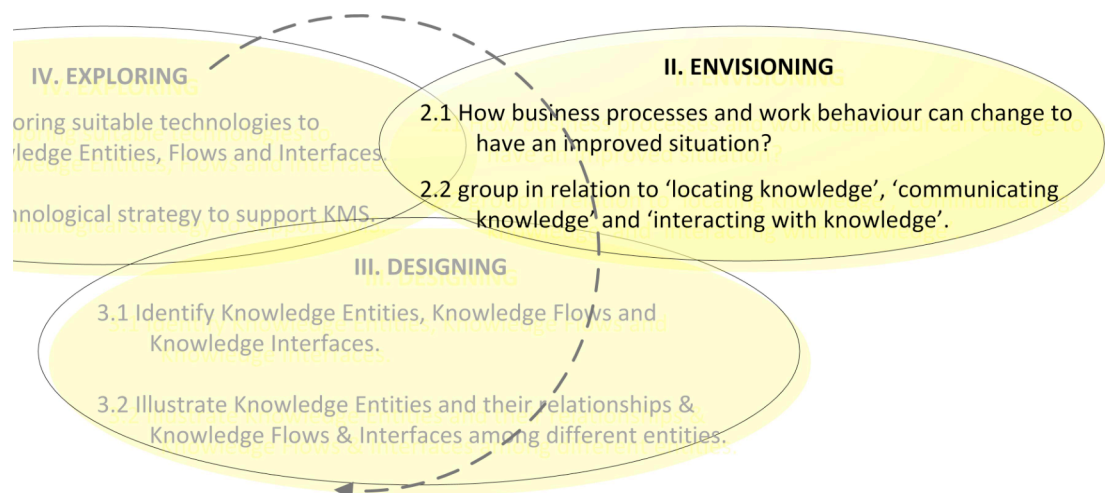


Figure 3: Activities in envisioning improved situation

Envisioning Activities

The second phase – envisioning improved situations, is based on participative activities and involves the two activities shown in Figure 3: conversations about changed work behaviour, and mapping to the ideas of ‘locating’, ‘communicating’ and ‘interacting with’ knowledge.

For these activities the project team must include all relevant stakeholders, e.g. contractors, suppliers and clients. In this phase the team aims to express an improved state of day-to-day business processes and work behaviour. This is often most easily done by describing current processes and behaviours and one by one envisioning an improvement to them. For example, the team addresses questions such as why each situation needs to change, how it can be changed and who will this change likely to impact. Envisioning improved situations can involve various techniques such as story telling, focus groups, interviews, participative observation, etc.

The focus here is still about business rather than technology issues, but now includes consideration of KM-related issues.

It is during this phase that the team addresses specific business processes and work behaviour problems in their current situation that need to change, and why they need to change. The goal is to construct new situations that move towards overall business purposes that emerged as result of

sensemaking. The original problems usually represent chaotic conditions in the organization and include what stakeholders 'don't know' and 'need to know' to improve business processes and how their business relationships with other stakeholders can change to improve collaboration.

The team (with the help of the consultants) captures 'knowledge-related concepts' that emerge from conversations in envisioning the desired improved situations and that are specific to the organization's business processes and work behaviour. These concepts are framed in the context of three themes (this is akin to axial coding in grounded theory by Glaser & Strauss 1967): 'locating knowledge', 'communicating knowledge' and 'interacting with knowledge'. These themes and their concepts are associated with various aspects (what Glaser & Strauss 1967 call properties and their dimensions) that also emerge in envisioning conversations. These are related for example to, what type of knowledge and why stakeholders need to locate it, when and how it may be communicated, and where and how they may interact with it.

The team records these concepts in a language that reflects the envisioned improved situation and not the problematic situation, to shift attitude towards a shared positive vision rather than individual negative memories; this is akin to what Senge *et al.* (1994) call "shared vision" and to what Cooperrider & Whitney (1999) call "dream" in appreciative inquiry. This represents a first transformation in 'desired change' towards the envisioned improved situations and that is when the KMS actually starts to emerge in the envisioned change in business processes and work behaviour.

Phase III: Designing KMS

Designing a KMS – highlighted in Figure 4 – is where the team proposes how the envisioned desired situations (i.e. business processes and work behaviour) can be represented by knowledge *agents*, knowledge *flows* and knowledge *interfaces* in a KMS. The terms emerged from earlier work (Moteleb & Woodman 2008). Knowledge agents, are essentially 'active entities' that are capable of holding and interacting with knowledge; they include people, documents, elements of IT, etc. Knowledge flows represent knowledge that is transferred between the active entities, the agents, and knowledge interfaces are the points of interaction. The concept of knowledge interfaces includes the medium for potential knowledge flows and the rules (protocols) which constrain them. So, for example, one knowledge agent could hold knowledge about all procurement projects and a knowledge interface would link it to a supplier (another knowledge agent), with the flow defining what procurement knowledge the supplier do (or could) receive or send.

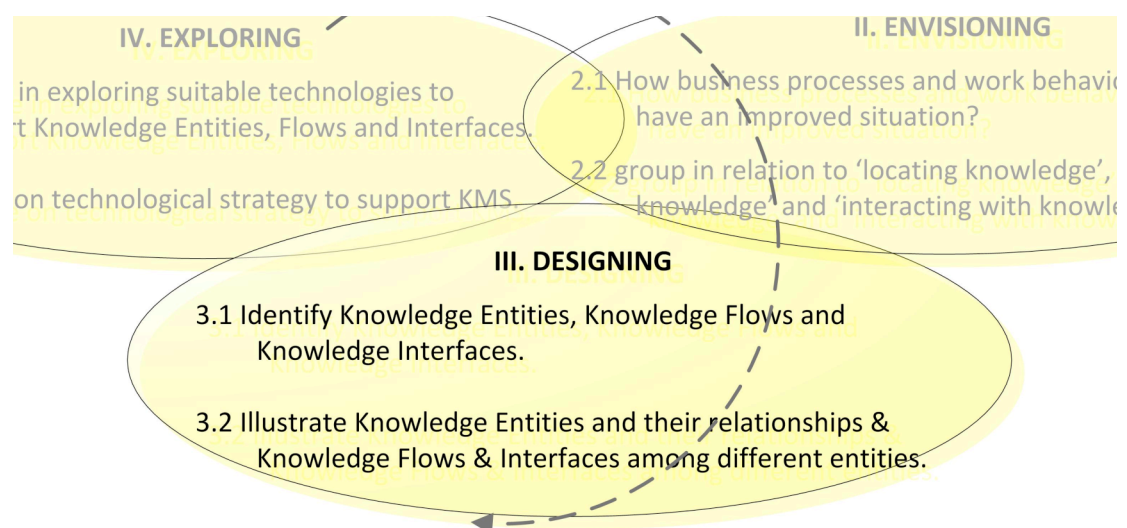


Figure 4: Activities in designing KMS

Because choices will subsequently be made, we can explain the development of a setting for knowledge agents, flows and interfaces as 'design'. This design is intended to be flexible and to accommodate different and changing perspectives. Although IT options may be considered in high-level terms, this KMS design is not about IT but about how an organization can work with envisioned KM concepts for improvement. Choices made in designing KMS are guided and constrained by an

organization's structure, culture, resources etc. Designing the KMS involves engaging stakeholders in the design of a KMS using knowledge agents, flows and interfaces and illustrating the viability of the KMS as an implementation of the envisioned future situation.

Designing Activities

The third phase is based on participative activities, in which the team engages in designing the KMS. The focus here is less on the business issues, more on KM issues and little on IT. The team re-arranges the envisioned improved situation that emerged in the second aspect around three themes of knowledge agents, flows and interfaces. These themes enable a logical and orderly representation of the envisioned improved situation. The ideas here can be mapped back to the earlier themes in sensemaking: knowledge agents (the active entities) are defined as any constituent in the envisioned improved situation that is capable of 'locating knowledge', 'communicating knowledge' and 'interacting with knowledge'. The team defines 'Knowledge Agents' by identifying persons (i.e. individuals or organizations) and artefacts (i.e. ideas, projects, tasks, expertise, etc.) that possesses knowledge that others are dependent on and/or that is dependent on others knowledge in order to perform tasks, and the existent or potential relationships among them.

Knowledge flows are defined as existing or potential knowledge communication among knowledge agents. This includes tacit knowledge as well as explicit knowledge (or information) that points at tacit knowledge.

Similarly, knowledge interfaces are defined as the ways, channels and rules that govern how this knowledge can be communicated. This includes any medium (i.e. physical places and virtual spaces).

Phase IV: Exploring Technology

Exploring technology to support the KMS – highlighted in Figure 5, is where the team considers potential technologies to (partially) support the KMS design that has been expressed in terms of Knowledge Agents, Knowledge Flows and Knowledge Interfaces. Potential technical implementations are considered according to degree to which they are likely to integrate organizational, social and technological aspects of the KMS and according to cost, complexity, availability, etc. The main activities are to engage problem stakeholders in exploring suitable technologies to support the representation of knowledge agents, flows and interfaces and to decide on a technology strategy of buying, building, integrating IT components and applications and to support the KMS.

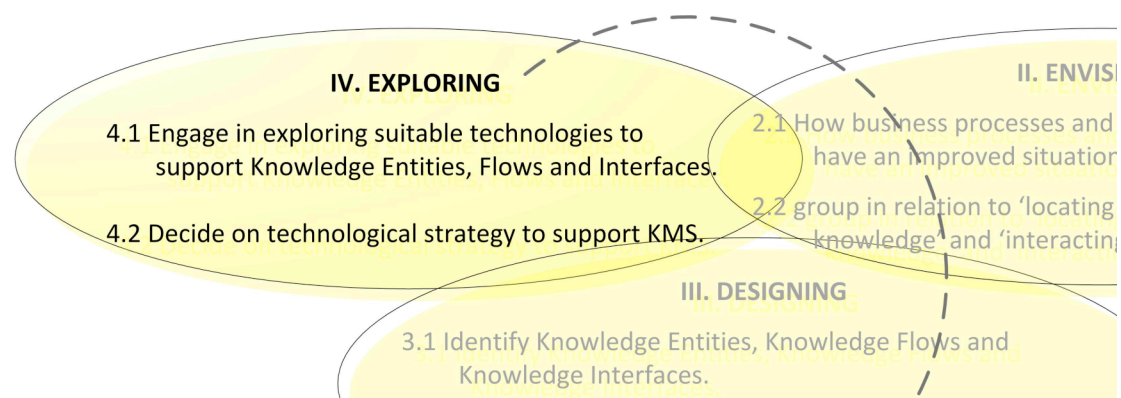


Figure 5: Activities in exploring technology

Exploring Activities

This fourth phase is about exploring IT to support the KMS. The focus here is less on KM and business and more on technologies to support the KMS design to realise the envisioned improved situation. The team collectively explores technologies that can enable the representation of knowledge agents, flows and interfaces. This can be achieved by integrating the organizational IT system with tools and technologies used by stakeholders. This has the advantage of allowing stakeholders to use technologies and tools, which they are comfortable with and allowing the organization to keep its IT infrastructure. Alternatively, the team may think that it would be better to invest in a new IT

infrastructure that fits the designed KMS. This can be through buying a suitable off-the-shelf software application that could be customised to support the KMS design or alternatively through developing a bespoke software application.

However, potential technical implementations are considered in terms of the estimated degree to which they are likely to integrate organizational, social and technological aspects of the KMS and not merely according to cost, complexity, availability, etc. This can result in dramatically different IT solutions that are in the interested of the team-stakeholders but possibly against the management-stakeholders. For example, blogs and wikis can be used to represent knowledge agents within an organisation, and would be expected by management to be based on its own IT infrastructure. If part of the social expectations of the workforce was for individuals to have the knowledge they contributed to the organisation while employees available to them after leaving, they might insist that the IT implementation of their knowledge agents be available to them after they leave the organization.

Phase V: Managing KMS evolution the evolutionary potential of change

Figure 6 shows the fifth aspect of the KMSD approach: it is concerned with ensuring that the KMS evolves in keeping with the changing organisational needs and the changing environment of the organisation. Its purpose is not 'technical' in that it is not purely to do with the KMS (and its use of IT or not). It has a monitoring and maintenance function (in Activity 5.1), but its purpose is also to detect oncoming changes in apparent 'signals' and 'trends' and (Activity 5.2) and to cycle back through the earlier phases making sense of the apparent changes, envisioning new work behaviour, etc. Inevitably the owners of the KMS may decide to start a new initiative (as depicted in Figure 1).

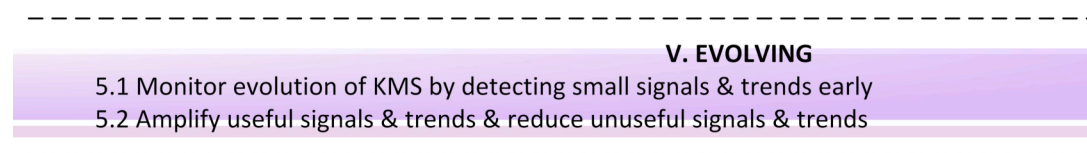


Figure 6: Activities in managing KMS evolution

Evolution Activities

The fifth aspect is about managing the evolutionary potential of change. The focus here is on managing the direction in which the KMS is evolving. The KMS is in a state of continuous improvement and its behaviour can never precisely be predicted by the organization, and thus is never completed or terminated. The organization needs therefore to notice (to detect) small signals of change and patterns of behaviour early to be able to manage the evolutionary potential of change. Starbuck & Milliken (1988 , cited in Weick 1995) put it thus: "Sensemaking focuses on subtleties and interdependencies, whereas noticing picks up major events and gross trends. Noticing determines whether people even consider responding to environmental events. If events are noticed, people make sense of them; and if events are noticed, they are not available for sensemaking" (Starbuck & Milliken 1988 , cited in Weick 1995).

5 Conclusion: Practicalities of the Guide to KMSD

We have presented explanatory elements of a guide to a practical and repeatable KMSD methodology. It consists of five phases – phases in the sense of transforming from one state to another, not steps. These are depicted in Figure 7 (and spelled out in Figure 9).

Typically, an organization expresses some problems in their own business terms. These problems often have general aims related to maintaining or improving competitive advantage and are usually expressed in terms of improvement and/or innovation in some aspect of their business such as business processes, work performance, and customers/supplier relationship management. This is explained by Weick (1995): "Once people begin to act (enactment), they generate tangible outcomes (cues) in some context (social), and this helps them discover (retrospect) what is occurring (ongoing), what needs to be explained (plausibility), and what should be done next (identity enhancement)".

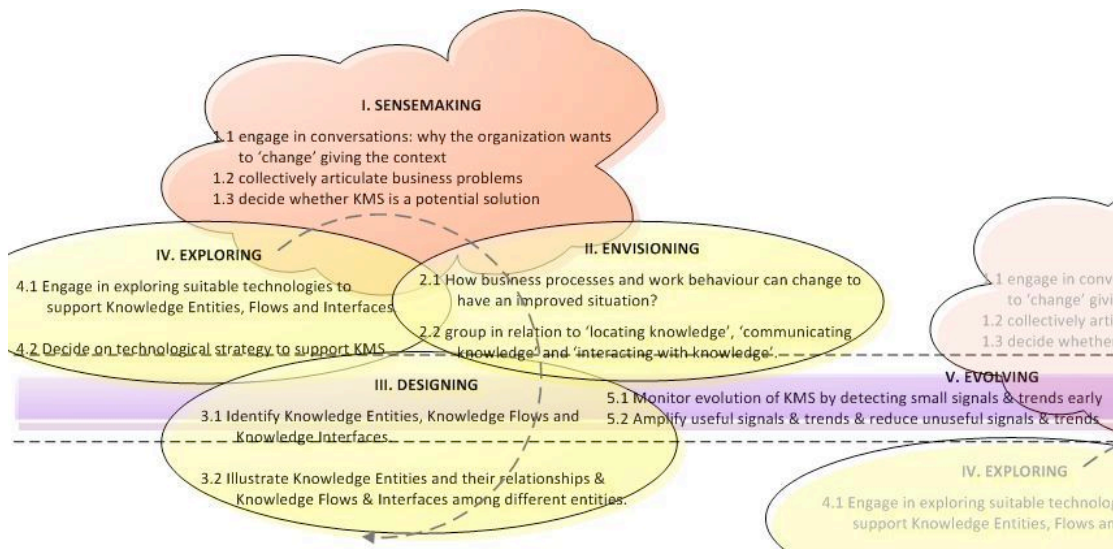


Figure 7: Guide for developing KMS in organizations

We conclude by reflection on the way in which the ideas from practice-based research have been refined. A draft of the full guide was given to one of the co-authors of this paper, as a consultant in the field, to try it out with an organization not involved in the underpinning research. Aiming to assist his client to understand the process, the consultant made suggestions for clarifying the terminology of the KMS approach and hence of the guide. Thus, the term 'knowledge entity' (Moteleb & Woodman, 2008) was replaced by 'knowledge agent' because of the mistaken assumption that an 'entity' was passive, an attribute that had not been ascribed to the concept in the original research. Another change was the replacement of the term 'aspect' with the more intuitively understood 'phase'.

The consultant thus provided the client with descriptions subsequently adapted for the guide. For example, Figure 8 introduces a principle of the KMSD methodology, while Figure 9 succinctly articulates the five phases without recourse to their rationale.

A key driving principle behind the approach is that a KMS can only work if fully owned by those in an organisation who can articulate its problems and who can envisage the changed situation. It is important to recognise that this is not about quick fixes but about a team creating a system that is sustainable by the organisation which will continue to develop the system. The role of the consultant is to be a guide.

Figure 8: Refined Introduction to KMSD methodology

We believe that the elements of our practical guide to KMSD contribute to KM practitioners and organisations considering their KM initiatives or how KM might help their enterprise. Further, we suggest that the work contributes to the calls in the literature for evidence-based method in KMSD.

The research was carried out in small-to-medium-sized enterprises (SMEs), which were appropriate because of the speed at which they react to changes in their environment and the speed at which they can effect change. Experience with large and very large organisations suggests that the KMS approach described is applicable, but is untested there. The guide whose elements are described here is a refined and reified description of the practice of KMD that emerged from research (cf. Moteleb & Woodman, 2008). It is therefore a representation of the concepts that emerged and were applied and validated in practice, clarified for the benefit of those not involved in the research.

The 5 Phases

Phase 1: Sense-making

Through sense-making conversations with management the consultant helps clarify challenges/problems facing the organisation:

- (1) Engage in conversation around why organisation wants to change.
- (2) Collectively articulate business problems.
- (3) Decide whether KMS is a potential solution – don't just assume that.

Phase 2: Envisioning improved situation

The team that is facing the problems, guided by the consultant, works together to address two questions:

- (1) How can business and work behaviour be changed to create an improved situation?
- (2) What aspects of knowledge in terms of 'locating', 'communicating' and 'interacting with knowledge' might be involved in bringing about the improved situation?

Phase 3: Designing the KMS

Without dwelling on technology the team works together with two purposes:

- (1) Identify knowledge agents, knowledge flows, and knowledge interfaces
- (2) Represent links between knowledge agents and their relationships & knowledge flows and interfaces

Phase 4: Exploring Technology

As the KMS is developed and operated, over time the team must:

- (1) Engage in collectively exploring suitable technologies to support knowledge agents, flows and interfaces
- (2) Decide on technology strategy to support KMS

Phase 5: Evolving

As the KMS is developed and operated, over time the team must:

- (1) Monitor changes in environment that might impact on KMS both negatively and positively.
- (2) Take steps to accentuate the positive!

Figure 9: Refined practical overview of five phases

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